









Owners will be Responsible for  
Debt contracted by the Officers or  
crew of the following Vessels, during  
their stay in Hongkong Harbour:—  
D. T. TENNEY, American ship, Capt. D.  
Radok. — Gibb, Livingston & Co.  
Boriz, Norwegian bark, Captain P. L.  
mekler. — S. masen & Co.  
VALOURE, British bark, Captain R.  
arin. — Chinese.



## AN ASTRONOMICAL MARVEL.

THE SPECTROSCOPIC ADVENTURE.

(New York Sun.)

One of the most interesting of all the wonderful achievements of the spectroscopic age is Professor Pickering's recently announced discovery of two binary stars whose components are so close that no telescope is powerful enough to separate them. The interest of the discovery is heightened by the fact that the two double stars are not mere telescopic or "inconspicuous" phenomena, but two of the best known stars of the second rank in the heavens. One of them is the celebrated *Mizar*, the middle star in the handle of the Great Dipper. As every star-gazer knows, this is a naked-eye double, its companion, *Alor*, being now visible to any moderately sharp eye, although a few centuries ago the Arabs regarded it as a good type of eight. They called the two stars the Horse and his Rider. With any telescope above an inch in aperture *Mizar* itself is seen double, its companion being a beautiful green color and distant about four hundred and a half seconds of arc. Professor Pickering's discovery is that the larger star of this pair is again double, the components being evidently about equal in size and excessively close, so close, in fact, that it is not to be expected that any telescope will ever be able to divide them. How, then, did Professor Pickering find out there were two stars there?

Our readers will remember that in an article on spectrum analysis, printed in the Sun some months ago, it was explained that rapid motions of the stars can be detected by alterations in the position of the dark lines in their spectra. Stars which are approaching the earth have the lines shifted toward the violet end of the spectrum, and those which are receding exhibit a shifting of lines toward the red end. The explanation of this is quite simple and exceedingly interesting. The case is analogous to that of sound. When the source of sound is swiftly approaching the ear, like the whistle of a locomotive, the sound waves are so to speak crowded closer together, and the effect is to heighten the pitch. The contrary effect is produced by the lengthening or drawing out of the waves, as the source of sound rapidly recedes from the ear. This is a matter of everyday experience to railroad travelers. In the same way when a body which emits light is swiftly approaching the eye, the light waves are crowded together, and the effect is to shift the lines of the spectrum toward the violet, which is the region of the shortest waves or undulations, and when

such a body is receding, the lines are shifted in the other direction. It is only necessary that the motion of approach or recession of the shining body shall be sufficiently rapid to be in some measure comparable with the velocity of light in order that these effects may be produced. The position of the lines in the spectra of the sun and the stars is so well known that astronomers are able to express the rapidity of such motions among the stars in miles per second. The same principle has been applied in measuring the velocity with which glowing matter ejected from the sun in solar eruptions approaches the eye of the observer, and in studying the rotation of the sun on its axis.

In studying and photographing the spectrum of *Mizar*, Professor Pickering has discovered that at regular intervals of fifty-two days, its lines appear doubled, particularly a conspicuous one called the K line. His explanation of this phenomenon is exceedingly ingenious and satisfactory, and will be found in strict accord with what we have said above about the effect of motion on the lines. Suppose the two stars of which *Mizar* is evidently composed to revolve around one another in a circle whose plane is so inclined to our line of sight that at one time they will approach and at another time will recede from us. According to the laws of physics, the two stars will always be

at opposite points of their orbit, swinging around their common center, as if they were affixed to the ends of an invisible rod poised upon its middle point. It is manifest that as one star approaches in the direction of the earth, the other must recede, and that their greatest velocity of approach and recession respectively will be attained when the two stars are at the extremities of that diameter of their orbit which is at right angles to our line of sight. The light of the two stars, since they cannot be optically separated, is blended in a single spectrum. But inasmuch as one of the sources of light which forms this spectrum is swiftly approaching the eye, while the other with equal velocity is receding from it, there must be a shifting in both directions, the effect of which is to produce a splitting or doubling of the lines. When the two stars are in those parts of their orbit where they are moving at right angles, or approximately so, to the line of sight, there is no shifting and no division of the lines.

This phenomenon has been so carefully and delicately studied by Professor Pickering, who has taken more than seventy photographs of the spectrum of *Mizar* in the past two years, that he has been able to estimate the velocity with which these waltzing stars are moving in their wonderful swing. It amounts to about a hundred miles in a second. His observations also furnish the necessary data for estimating the distance apart and the size of the two stars. He concludes that they are about 143,000 miles from one another, which happens to correspond with the distance of *Mars* from the sun, and that their combined mass, or weight, is equal to forty times that of our sun.

They are not to be likened to a planet and a sun, for, as we have remarked above, they must be of nearly equal size, and both must blaze with solar light and heat, pouring out their fierce beams upon another while, grappled together with a gravitational energy in comparison with which the tremendous force that unites the solar system seems puny indeed; they wheel like giant wrestlers in a full arm swing. It would be beyond the power of mathematics to predict the orbits that planets belonging to such a pair of stars might describe; but the imagination is staggered at the thought of the night that would be presented to the dwellers upon such planets.

The other star which Professor Pickering's spectroscopic observations have shown to be a binary of a similar kind is *Monk*, the second brilliant in rank in the constellation of Auriga. It may be seen in the evening high in the northwest heavens

## SHARE LIST.—QUOTATIONS.

Hongkong, Saturday Noon, 21st June, 1890.

STOCKS.	When Established.	Capital.	No. of Shares.	Par Value of Share.	Amount Paid up per share.	POSITION PER LAST REPORT.			Dividend value per share as per figures and at date of last Report.	Annual Yield to Investors at closing price, on basis of last Dividend.	CASH QUOTATIONS. (For Time Bargains see memo. at foot.) DURING CURRENT WEEK.			
						Reserve Fund.	At credit of working eff. or Bal. Profit fud.	Dividend.			Closing.	Highest.	Lowest.	
														Amount.
<b>Banks.</b>														
Hongkong & Shanghai Bank- ing Corporation .....	1865	7,600,000	60,000	125	all	\$ 4,000,000	141,310.47	20 and 10% bonus for 1889, 10% for 1890 at 31/12/89	Feb. 24, 90	\$208.10	6.06 per cent.	104 1/2 prem., buyers	194 1/2 prem.	190 1/2 prem.
<b>Marine Insurance.</b>														
Union Insurance Society of Canton, Limited .....	1867	2,600,000	10,000	250	25	732,500	335,220	28% for 1889 estimated to 30 June 89	Oct. 11, 89	\$104.75	7.00	\$100, sellers	—	—
China Traders' Insurance Co., Ltd.	1865	2,000,000	24,000	83.33	25	650,000	231,343.91	20 per cent. 50% at 30 June 89	Sept. 10, 89	\$52.08	7.04	\$71, sellers	—	—
North China Insurance Co., Ltd.	1863	1,000,000	5,000	200	50	Tls. 320,000.00	Tls. 303,975.94	10% for 1889—Tls. 10.25	April 11, 90	Tls. 297	7.94	Tls. 350, buyers	—	—
Yangtze Insur. Association, Ltd.	1862	800,000	8,000	100	all	\$ 610,617.59	—	\$6 per share for 1889	Mar. 12, 90	Tls. 109.48	4.87	Tls. 88 1/2, sellers	—	—
Chinese Insurance Co., Ltd. (in liquidation) .....	1871	1,600,000	1,600	1,000	200	28,711.50	15,285.84	3 per cent. for 3 yrs. to 31/12/89 at 6 per cent. for 1890	April 3, 88	—	—	—	—	—
Canton Insurance Office, Ltd.	1881	2,500,000	10,000	250	60	417,000	493,208.50	14% for 1889, 10% for 1890 at 30 Sept. 89	Jan. 2, 90	\$91.70	5.83	\$120, nom.	—	—
Straits Insurance Co. Ltd. ....	1866	3,000,000	30,000	100	20	115,000	113,000	10% for 1888, 5% for 1889, 10% for 1890 at 31 Dec. 1889	April 1, 89	\$22.83	9.99	\$20, nom.	—	—
<b>Fire Insurance.</b>														
Hongkong Fire Insur. Co., Ltd.	1865	2,000,000	8,000	250	30	1,050,049	303,349.20	5% for 1889, 5% for 1890 at 31/12/89	Feb. 25, 90	\$182.00	6.43	\$357 1/2, buyers	—	—
China Fire Insurance Co., Ltd.	1870	2,000,000	20,000	100	20	700,000	244,086.53	5% for 1889, 5% for 1890 at 30 June 89	Feb. 25, 90	\$20.	5.83	\$13, buyers	—	—
Straits Fire Insurance Co., Ltd.	1866	2,000,000	20,000	100	20	20,000	110,818	5% for 1889, 5% for 1890 at 31/12/89	Feb. 20, 90	\$20.	5.83	\$13, buyers	—	—
<b>Fire and Marine Insurance.</b>														
Singapore Insurance Co., Ltd.	1884	4,000,000	40,000	100	20	11,875.91	206,340.91	10% for 1889, 10% for 1890 at 31/12/89	April 23, 90	\$20.00	5.00	\$14, nom.	—	—
<b>Docks and Wharves.</b>														
Hongkong & Whampoa Dock Co., Ltd.	1866	1,562,500	12,500	125	all	—	29,440.92	10% for 1889, 10% for 1890 at 31/12/89	Feb. 25, 90	\$131.79	6.48	35% prem., buyers	—	—
Hongkong & Kowloon Wharf & Godown Co., Limited	1866	1,000,000	20,000	50	all	—	2,755.25	10% for 1889, 10% for 1890 at 31/12/89	July 27, 89	\$109.15	3.37 on old cap.	\$74, sellers	—	—
<b>Shipping.</b>														
Hongkong, Canton & Macao Steam-boat Co., Limited	1865	1,600,000	80,000	20	all	—	29,440.92	10% for 1889, 10% for 1890 at 31/12/89	Feb. 1, 90	\$31.62	8.76 per cent.	\$384, buyers	—	—
Indo-China Steam Navigation Co., Limited .....	1882	1,200,000	60,000	10	all	—	1,606.14	10% for 1889, 10% for 1890 at 31/12/89	June 13, 89	\$10.94	0.72	20% dis., buyers	—	—
Douglas Steamship Co., Ltd.	1883	1,000,000	20,000	50	all	—	1,790.48	10% for 1889, 10% for 1890 at 30 June 1889	Sept. 23, 89	\$82	7.27	\$55, sellers	—	—
China & Manila S. S. Co., Ltd.	1882	175,000	3,400	50	all	—	2,461.66	10% for 1889, 10% for 1890 at 31/12/89	Mar. 10, 90	\$97.09	7.76	\$103, buyers	—	—
Steam Launch Company, Ltd.	1888	100,000	2,000	50	30	—	1,097.55	10% for 1889, 10% for 1890 at 31/12/89	—	par nominal	—	—	—	—
<b>Refineries.</b>														
China Sugar Refining Co., Ltd.	1878	1,600,000	16,000	100	all	—	11,875.91	10% for 1889, 10% for 1890 at 31/12/89	Mar. 7, 90	\$100.79	14.97	\$157, sellers	—	—
Luzon Sugar Refining Co., Ltd.	1882	700,000	7,000	100	all	—	143,223	10% for 1889, 10% for 1890 at 31/12/89	Mar. 7, 90	\$102.73	3.48	\$85, buyers	\$87	\$77
<b>Lands and Trusts.</b>														
Hongkong Land Investment & Agency Company, Ltd. ....	1869	5,000,000	50,000	100	50	1,230,000	801.04	7% per ann. for 1889, 7% for 1890 at 31/12/89	Jan. 24, 90	\$74.91	3.97	\$88, sellers	\$90	\$86
Kowloon Land and Building Company, Ltd. ....	1889	300,000	6,000	50	30	—	1,637.15	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$15, sellers	—	—
Trust & Loan Co. of China, Ltd.	1889	1,000,000	99,875	10	1.15	—	1,250.42	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$122, buyers	—	—
<b>Tramways.</b>														
Hongkong High-Level Tram- ways Company, Limited	1887	125,000	1,250	100	all	—	214.55	10% for 1889, 10% for 1890 at 31/12/89	—	par nominal	—	\$100, buyers	—	—
<b>Mining.</b>														
(a) The Balaclava Gold Mining Co., Ltd.	1889	150,000	15,000	10	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$13, buyers	\$13 1/2	\$13
(b) The Balaclava Gold Mining Co., Ltd.	1889	225,000	22,500	10	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$31, buyers	—	—
(c) The Balaclava Gold Mining Co., Ltd.	1889	125,000	12,500	10	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$31, sellers	—	—
(d) The Balaclava Gold Mining Co., Ltd.	1889	125,000	12,500	10	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$5, nom.	—	—
(e) The Balaclava Gold Mining Co., Ltd.	1889	125,000	12,500	10	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$81, buyers	—	—
(f) The Balaclava Gold Mining Co., Ltd.	1889	600,000	60,000	10	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$35, sellers	—	—
(g) The Balaclava Gold Mining Co., Ltd.	1888	1,000,000	6,000	600	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$51, buyers	—	—
(h) The Balaclava Gold Mining Co., Ltd.	1889	175,000	17,500	10	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	—	—	—
<b>Planting, &amp;c.</b>														
East Borneo Planting Co., Ltd.	1888	200,000	4,000	50	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$15, buyers	—	—
(a) The Balaclava Gold Mining Co., Ltd.	1888	250,000	5,000	50	40	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$15, buyers	—	—
(b) The Balaclava Gold Mining Co., Ltd.	1888	750,000	7,500	100	50	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$15, sales	—	—
(c) The Balaclava Gold Mining Co., Ltd.	1889	250,000	5,000	50	25	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	nominal.	—	—
(d) The Balaclava Gold Mining Co., Ltd.	1889	300,000	4,000	50	15	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	nominal.	—	—
(e) The Balaclava Gold Mining Co., Ltd.	1889	300,000	6,000	50	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$47, nom.	—	—
(f) The Balaclava Gold Mining Co., Ltd.	1889	300,000	6,000	50	25	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	nominal.	—	—
<b>Hotels, Building, &amp;c.</b>														
Hongkong Hotel Co., Limited ..	1868	300,000	3,000	100	all	—	7,452.03	3% for 8m. end- ing 31/12/89	Mar. 4, 90	\$101.10	3.80	\$200, nom.	—	—
Austin Arms Hotel & Building Company, Limited .....	1888	200,000	4,000	50	25	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	25% dis., nom.	—	—
Peak Hotel & Trading Co., Ltd.	1889	200,000	4,000	50	20	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	nom.	—	—
West Point Building Co., Ltd.	1889	625,000	12,500	50	40	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$37, sellers	—	—
Shamshen Hotel & Land Co., Ltd.	1889	100,000	5,000	20	10	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$5, nom.	—	—
Richmond Terrace, Estate and Building Company, Ltd.	1889	100,000	1,000	100	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$200, nom.	—	—
Borneo Hotel & Stores Co., Ltd.	—	50,000	1,000	50	30	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	14.06	—	—
<b>Dispensaries.</b>														
A. S. Watson & Co., Limited ..	1886	500,000	5,000	10	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	6.51	—	—
Cruikshank & Co., Limited ..	1888	80,000	1,600	50	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	11.11	—	—
<b>Lighting.</b>														
Hongkong & China Electric Co., Ltd.	1864	50,000	5,000	10	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	6.29	—	—
Gas Co., Limited .....	1889	20,000	1,000	10	7.10	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$70, nom.	—	—
Hongkong Electric Co., Limited	1889	300,000	30,000	10	6	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	—	—	—
<b>Iron Foundries.</b>														
Geo. Fawcett & Co., Limited ..	1889	150,000	6,000	25	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	—	—	—
A. G. Gordon & Co., Limited ..	1889	150,000	6,000	25	20	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	—	—	—
<b>Brick and Cement.</b>														
Hongkong Brick and Cement Company, Limited .....	1886	100,000	4,000	25	17.50	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$16, nom.	—	—
Green Island Cement Company Limited .....	1886	1,000,000	20,000	50	50	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$33, nom.	—	—
<b>Miscellaneous.</b>														
Hongkong Ice Co., Limited .....	1861	125,000	5,000	25	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	6.12	—	—
H'kong & China Bakery Co., Ltd.	1872	30,000	600	50	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	5.88	—	—
H.K. Rope Manufacturing Co., Ltd.	1883	150,000	3,000	50	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	5.55	—	—
Dairy Farm Co., Limited .....	1886	100,000	10,000	10	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	\$5.00	—	—
Campbell, Moore & Co., Limited	1886	12,000	1,200	10	all	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	—	—	—
Marinburg Furniture Co., Ltd.	1889	75,000	3,000	25	6	—	—	10% for 1889, 10% for 1890 at 31/12/89	—	—	—	—	—	—







